

# PATENT SPECIFICATION

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DRAWINGS ATTACHED

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## (54) IMPROVEMENTS IN OR RELATING TO LIQUID OR PASTE DISPENSERS

(71) We, DIAMOND INTERNATIONAL CORPORATION, a corporation organized and existing under the laws of the State of Delaware, United States of America, of 733  
 5 Third Avenue, New York, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed,  
 10 to be particularly described in and by the following statement:—

The invention relates to a dispenser for liquid and paste products.

The invention provides in combination, a  
 15 container member having a tubular neck of resiliently deformable material defining a circular mouth at its upper end, and a closure member having a top wall for axial  
 20 abutment with the upper end of the neck, and a depending skirt encircling the neck, said neck having an upper end portion of substantially frusto-conical configuration  
 25 diverging downwardly from its mouth, with the base of said portion projecting radially outwardly from the axially adjacent sections  
 30 of the neck to provide a snap bead, a stopper depending from said top wall of the closure member and snugly received in said mouth,  
 35 a radially inwardly projecting snap bead formed within the skirt of said closure member and of a diameter less than that of said  
 40 base to radially compress the latter during movement downwardly over said frusto-conical portion and engage beneath said base  
 45 incident to radial expansion of the latter, said top wall being axially spaced from the skirt bead a distance to thrust axially against said upper end of the neck and to urge said mouth radially into sealing engagement with the stopper.

A specific example of a dispenser according to the invention will now be described with reference to the accompanying drawings in which:—

45 Figure 1 is a view in axial section through a pump type dispensing container embodying the preferred form of the invention;

Figure 2 is a side elevation on a somewhat reduced scale compared with Figure

1 showing the container only with the closure cap and dispensing pump removed; and

Figure 3 is an enlarged detail section of interconnected portions of the container neck and closure cap.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in detail to the drawings, the invention as illustrated therein is embodied in a dispenser comprising an inner  
 60 container member of a suitable elastomeric plastic material, such as polyethylene, having a main body 10 of any suitable cross-sectional shape and a tubular neck 12 of  
 65 circular cross-sectional configuration, the upper end of which defines a container mouth or outlet 14 surrounded preferably by  
 70 axially directed sealing rings 15 concentric to each other and radially spaced for sealing reception between them of the sealing  
 75 ring 16 carried by the top wall 18 of a closure cap generally designated 20 and having an internally threaded skirt 22 for co-operation with the externally threaded container neck 12 in a manner more fully described hereinafter.

In the preferred embodiment of the invention, the container 10 is flexible and collapsible; and it is, therefore, desirable that it be supported within a rigid outer casing  
 80 or housing of which the container closure cap 20 may form a part, together with a cup-like casing member of vinyl or other rigid plastic 24.

It will be seen in Figure 1 that the collapsible container 10 is connected to the  
 85 closure cap and supported thereby in suspended fashion within the container section 24. In order to interconnect the closure and casing body 24, the closure member 20  
 90 is formed with a preferably integral shoulder 26 projecting radially outwardly from the lower periphery of its skirt 22 and having depending therefrom a generally conventional snap ring or rib 28 for cooperation in  
 95 usual manner with an inwardly projecting snap ring 30 at the upper edge of the con-

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tainer body 24. A downwardly directed surface 32 of the shoulder 26 rests on and abuts against the upper edge of the casing body 24 to provide axial support for the closure cap and the container itself on the casing body 24.

In the present instance, a supply of liquid housed within the container 10 is adapted to be withdrawn therefrom and dispensed by a pump of generally conventional structure including a stationary pump cylinder or barrel 34 which preferably is formed integrally with the top wall 18 of the cap and depends axially therefrom into the container in the manner such as disclosed in U.S. Patent No. 3,248,021 of April 26, 1966. It will be seen that the barrel 34 opens upwardly through the cap for reception of the reciprocating pump plunger 36, through which suitable discharge passages (not shown) extend for connection to a discharge spout 38 carried by the external end of the plunger 36. It will be understood that the plunger may be of the usual spring projected type for actuation by intermittent finger pressure on its upper end portion or head 40, as in the Corsette et al U.S. Patent 3,248,021.

In order to seal the pump against the inadvertent escape of the container contents or influx of air to the container between the plunger and cylinder, it may be desirable to form the cap with an upwardly directed internally threaded sleeve 42 for cooperation in the usual manner with an externally threaded base portion 44 of the plunger head. By threading down this base portion 44 tightly into the internally threaded sleeve or socket 42, a seal 46 is established. Also, the base of the externally threaded plug 44 sealingly engages the shoulder or ledge 48 within the pump barrel.

When it is desired to use the pump for dispensing the container contents, the threaded plug portion 44 of the plunger is rotated to release it from the internally threaded sleeve or socket 42, whereupon it may be reciprocated to dispense the desired amount of contents from the container.

The container member 10 is subjected to atmospheric pressure which is free to enter the outer casing 24 through an opening 50 in the bottom thereof. Thus, as the container contents are withdrawn by the pump, the atmospheric pressure will collapse the container around the pump barrel 34. In order to preserve a clear path of entry for substantially all of the container contents into the pump barrel as the container collapses around the barrel, it is desirable to form the barrel with a series of slots, such as 52, extending upwardly from its lower end but terminating at a location somewhat below the range of reciprocation of the plunger piston (not shown) within the cylinder.

The arrangement as thus far generally described exemplifies the type of arrangement, such as disclosed in prior United States Specification 3,288,334, in which it is essential that seepage of air into the container, as well as loss of the container contents through the closure member, be prevented by an efficient sealing relationship between the container and closure members. While such an arrangement is one in which the present invention finds particular utility, the invention is by no means restricted to this specific use.

The present invention not only provides an efficient sealing relationship, but also provides for easily and efficiently applying the cap to the container. Moreover, in accordance with a further aspect of the invention, the cap is applied in a manner such that it is locked onto the container and, after its initial application, cannot be removed without damage or destruction of the various parts. Thus, a manufacturer who employs such a container for the sale of his product has some assurance that the container cannot be refilled with a spurious product without knowledge of the consumer.

Now, considering in more detail the specific connection of the closure cap or member to the container member, it will be seen by reference to Figures 1 and 2 that the container neck 12 is formed externally with a radially projecting snap bead, generally designated 56, adjacent but below its mouth 14, while the closure cap 22 is formed internally with a radially inwardly projecting snap bead 58 for cooperation with the snap bead 56. Both of the snap beads have radially presented annular crests 56', 58' respectively disposed in radial planes with respect to their axes of relative rotation, and, the bead 58 of the cap is normally of smaller diameter at its crest 58' than is the neck bead.

Moreover, both the cap skirt 22 and the neck 12 are provided below their respective snap beads with threaded sections 60 and 62 respectively. These threaded sections are axially located and dimensioned to interengage during threading of the cap downwardly onto the container neck only prior to and during such time as the crest 58' of the cap or closure bead moves downwardly onto and through a dead center position in which its crest 58' is in a common radial plane with the crest 56' of the neck snap bead 56. The threads 60 and 62 are of such axial location and extent as to disengage immediately upon downward movement of the closure bead 58 through or past this dead center position.

Preferably, each of the threaded sections comprises multiple threads of identical pitch, and axially coextensive, so that they will exert equal axial forces at locations concen-

tric to the axis of relative rotation of the container and closure members, thus avoiding any tendency to axially tilt or cant the members relative to each other.

5 As has been above mentioned in the preferred embodiment, the container member 10 itself, including its neck 12, is formed of a suitable flexible resiliently deformable material such as will permit radial compression of its neck at the location of the bead 56 to permit movement therepast of the closure bead 58.

10 In order to provide for radial contraction or compression of the neck so that the snap beads 56 and 58 may move past each other during application of the closure member, one of the beads, in this instance the skirt bead 58, is provided with a generally conical cam surface 58a which diverges axially downwardly from its crest 58'. Thus, as the closure cap is threaded downwardly onto the container neck, the camming engagement of the conical surface 58a with the bead 56 will radially deform and, in the present instance, radially compress the container neck at the base of its conical surface 56a until the beads snap past each other.

15 At this time, it will be understood that the closure threads 60 will have passed downwardly through the neck threads 62 and thus become disengaged, though the two sets of threads may still be in axial abutment, and the radially compressed portion of the neck will be free to re-expand.

20 In order to produce a slight axial separation between these threads or threaded sections such as will prevent their subsequent cooperation to facilitate removal of the cap, one of the snap beads, in the present instance the bead 58 of the cap, is provided with a conical cam surface 58b which diverges axially upwardly from its crest 58' for continued camming engagement with the other bead 56, incident to expansion of the latter with the neck, to pull the cap still further onto the container neck after the threads are disengaged. Preferably, the slope of the cam surface 58b is sufficiently sharp as to thereafter firmly secure the closure member on the container member.

25 It will be noted that the closure member 20 above its snap bead 58 is of somewhat less internal diameter than the crest of the snap bead 56 on the neck so that, even after the beads 56, 58 snap past each other, the closure member still exerts a radial confining and compressing action on the neck at the level of its bead 56. By thus axially confining the neck, it produces an axial elongation of the neck into sealing engagement with the closure top wall, while also camming the top wall axially against the neck, to maintain an efficient seal.

30 It will further be seen that the neck is

formed above the bead 56 with a tapering substantially conical portion 56a which diverges downwardly from adjacent the mouth 14 of the container to the crest of bead 56, and is preferably coincident with the upper surface of bead 56.

70 The top wall of the closure member carries an annular rigid stopper 66 which is snugly received in the mouth 14. Because of the conical configuration of the upper end portion of the neck, the axial thrust between the closure top wall 18 on the upper end of the neck urges the upper end radially inwardly so as to contract the container mouth 14 into firm radial sealing engagement with the stopper. At the same time, the stopper backs up the container mouth against the radially inward deflection produced by the axial thrust of the closure top wall. The stopper thus defeats the tendency of the flexible plastic neck material to "cold flow" or weaken with time under the continuing stress imposed on it.

#### OPERATION OF THE INVENTION

35 In the operation of the invention which is believed to be apparent from the foregoing description, the closure member with its pump support therein will normally be applied to the filled container prior to insertion of the latter into the casing 24. The pump will be inserted downwardly into the container neck, while the closure member 20 will be applied axially onto the neck 12 until the threaded portions 60 and 62 respectively are interengaged. Relative rotation between the container member 10 and closure member 20 will then function to draw the snap bead 58 of the closure member downwardly just past the dead center position with respect to the container snap bead 56, thus radially compressing the neck in the radial plane of its bead 56, at which time the threads of the closure member will have passed downwardly completely through the threads of the container neck. At this time, the camming action of the snap bead surface 58b against the neck snap bead 56, incident to radial expansion of the neck, will draw the closure member further down onto the container neck sufficiently to axially separate the threaded sections 60 and 62 as well as to bring the top wall 18 of the closure cap into axially thrusting sealing engagement with the upper end of the container neck.

40 In the interlocked condition of the snap beads 56 and 58, the snap bead 56 of the neck will still be maintained under radial compression in the closure member. Because of the conical configuration of the upper end of the neck, such compression will generate an axial component of thrust of the neck against the top wall of the closure as well as a radially inwardly component causing the outlet or mouth 14 at

the upper end of the neck to contract around and radially seal against the stopper 66.

Moreover, it will be seen that the annular stopper 66 functions in this arrangement to back up the periphery of the container mouth 14 against radially inward pressures resulting from its thrusting engagement with the top wall 18 of the container member and thus will defeat any tendency of the flexible plastic material of the neck to cold-flow or weaken with time under the stresses which are applied to it.

After the closure member and pump are thus applied to the container member 10, the container is then disposed within the comparatively rigid casing 24 and the lower periphery of the container shoulder 26 is snap fitted onto the container casing 24 in a manner that will be readily apparent.

The pump may then be employed in conventional manner to dispense the contents of the container 10 as desired. In order to use the pump, it is necessary first to rotate it to disengage its threaded portion 44 from the internally threaded socket 42 of the closure member whereupon it may be reciprocated by intermittent finger pressure on the plunger head 40 to expel the product from the container through the spout 38.

As the product is withdrawn from the container, the latter is collapsed by atmospheric pressure entering the container casing 24 through the opening 50. It is not necessary that the pump have its intake located near the lower end of the container inasmuch as the collapsing of the container around the pump cylinder will urge the product into the cylinder through the intake slots 52 and open lower end of the pump cylinder.

In this application, I have shown and described only the preferred embodiment of the invention, having in mind that various modifications will be readily apparent to persons of average skill in the art, without departing from the inventive concept as defined in the appended claims.

#### WHAT WE CLAIM IS:—

1. In combination, a container member having a tubular neck of resiliently deformable material defining a circular mouth at its upper end, and a closure member having a top wall for axial abutment with the upper end of the neck and a depending skirt encircling the neck, said neck having an upper end portion of substantially frusto-conical configuration diverging downwardly from its mouth, with the base of said portion projecting radially outwardly from the axially adjacent sections of the neck to provide a snap bead, a stopper depending from said top wall of the closure member and snugly received in said mouth, a radially inwardly projecting snap bead formed within the skirt of said closure member and of a

diameter less than that of said base to radially compress the latter during movement downwardly over said frusto-conical portion and engage beneath said base incident to radial expansion of the latter, said top wall being axially spaced from the skirt bead a distance to thrust axially against said upper end of the neck and to urge said mouth radially into sealing engagement with the stopper.

2. The combination defined in Claim 1, in which said bead of the skirt is formed with an upwardly presented annular cam surface of conical configuration for engagement with said snap bead of the neck to thrust said top wall of the cap against the upper end of the neck incident to radial expansion of the neck snap bead beneath the neck bead.

3. The combination defined in Claim 2, in which said neck and said skirt are provided below their respective snap beads with cooperating threaded sections arranged to interengage incident to rotary movement of the closure member as it is applied to the container member whereby to urge said snap bead of the skirt downwardly over said base, and to disengage as said neck snap bead is engaged by said annular cam surface of the skirt, the ensuing radial expansion of the neck base following its passage through said skirt snap bead relatively axially moving said closure onto the neck and axially separating said threaded sections.

4. The combination defined in Claim 3, in which said threaded sections are provided with multiple coaxial threads, of similar pitch, each occupying but a fraction of the circumference of its respective section, the threads of the respective sections simultaneously engaging at a plurality of circumferential locations around said sections to avoid the creation of axial tilting forces between the container and closure members.

5. The combination defined in Claim 1, in which said container and closure members respectively include telescopically interfitted portions spaced axially a substantial distance from their said snap beads.

6. The combination of Claim 5, in which said telescopically interfitted portions are of substantially larger diameter than said snap beads.

7. In combination, a container member having a tubular neck defining a dispensing outlet through its upper end, and a closure member adapted for axial reception on and sealing engagement with the upper end of said neck, one of said members being of resiliently deformable material, said neck having an upper end portion of substantially frusto-conical configuration diverging downwardly from its said dispensing outlet, the base of said upper end portion being encircled by a radially outwardly projecting

5 snap bead and said closure member having  
a skirt encircling the neck and formed with  
a radially inwardly presented snap bead,  
both of said snap beads having radially pre-  
10 sented annular crests in radial planes of the  
members, said bead of the closure member  
being normally of substantially smaller  
diameter at its crest than that of the neck,  
both said neck and said skirt having co-  
15 operating threaded sections below their snap  
beads, said threaded sections being located  
and dimensioned to interengage during rela-  
tive axial movement of said crests into and  
through a dead centre position in a common  
20 radial plane as the closure member is  
threaded onto the container neck, and being  
arranged to disengage immediately upon  
movement through said dead center position,  
one of said beads having an axially down-  
25 wardly diverging conical cam surface for  
engagement with the other bead to radially  
deform said deformable member incident to  
threading of the closure member onto the  
container neck, one of said beads having  
25 an axially upwardly diverging conical cam  
surface for camming engagement with the  
other said bead after movement of the beads  
past said dead center position and disen-  
gagement of the said threaded sections to  
30 axially separate the threaded sections, said  
closure member having means positioned  
to axially seal against said container neck  
and arrest the downward movement of the  
closure member before said deformable  
35 member has fully regained its normal radial  
dimension.

8. The combination of Claim 7, in which  
said means positioned to axially seal against  
40 the container neck comprises the top wall of  
the closure member.

9. The combination of Claim 7, in which  
said container and closure members respec-  
tively include telescopically interfitted por-  
45 tions spaced axially below and of substan-  
tially larger diameter than said snap beads.

10. The combination of Claim 7, in  
which said threaded sections are provided  
with multiple coaxial threads, of similar  
pitch, each occupying but a fraction of the  
50 circumference of its respective section, the  
threads of the respective sections simultane-  
ously engaging at a plurality of circumferen-  
tial locations around said sections to avoid  
the creation of axial tilting forces between  
55 the container and closure members.

11. The combination defined in Claim 7,  
in which said container member is of re-  
siliently deformable material, and its neck  
is maintained under radial compression by  
60 the closure member, and thus caused to  
exert a resilient axial sealing thrust against  
the closure member.

12. The combination defined in Claim  
7, in which said container member is of

resiliently deformable material, said snap 65  
bead of the skirt having formed thereon said  
upwardly diverging cam surface for cam-  
ming said closure member further onto the  
neck incident to partial radial re-expansion  
70 of the neck bead after passing through the  
crest of said skirt bead, the internal diameter  
of the skirt immediately above its said snap  
bead being greater than the crest diameter  
of its said snap bead but smaller than the  
75 crest diameter of said neck snap bead, to  
maintain said snap bead of the neck under  
radial compression, and thereby to resiliently  
thrust the upper end of the neck into axial  
sealing engagement with said top wall of the  
80 closure member.

13. The combination defined in Claim 7,  
in which the upper end of said neck has a  
substantially conical configuration converg-  
ing upwardly from said neck bead substan-  
85 tially to the container mouth, and its upper  
end around the mouth is of substantially  
smaller diameter than its said external snap  
bead, for axial abutment with the closure  
member, a stopper carried by said closure  
member and depending into said mouth, said  
90 resilient axial thrust of the neck against said  
top wall, in combination with the conical  
configuration of said upper end of the neck,  
urging the inner periphery of said neck into  
radial sealing engagement with said stopper. 95

14. In combination, a container member  
having a tubular neck of resiliently deform-  
able material defining a circular mouth at  
its upper end and a closure member of com-  
paratively more rigid material than the neck 100  
having a top wall for axial abutment with  
the upper end of the neck and a depending  
skirt encircling the neck, a radially outwardly  
projecting annular snap bead formed on and  
encircling the neck, the upper end portion 105  
of said neck being of generally frusto-  
conical configuration diverging downwardly  
from its upper end to a maximum diameter  
no greater than that of the snap bead, a  
radially inwardly projecting snap bead 110  
formed within the skirt of said closure mem-  
ber, said snap bead of the skirt being formed  
with a downwardly diverging conical cam  
surface for radially compressing the neck  
115 snap bead and adjacent portions of the said  
neck and for thus axially elongating said  
end portion of the neck incident to move-  
ment of the closure member axially down-  
wardly onto the neck, a stopper carried by  
said top wall and depending into said mouth, 120  
one of said beads having an axially up-  
wardly diverging conical cam surface located  
for camming engagement with the other said  
bead to resiliently thrust the top wall of the  
closure member axially against said end of 125  
the neck incident to partial radial re-expansion  
of the neck bead after movement of  
said bead crests past each other, and there-

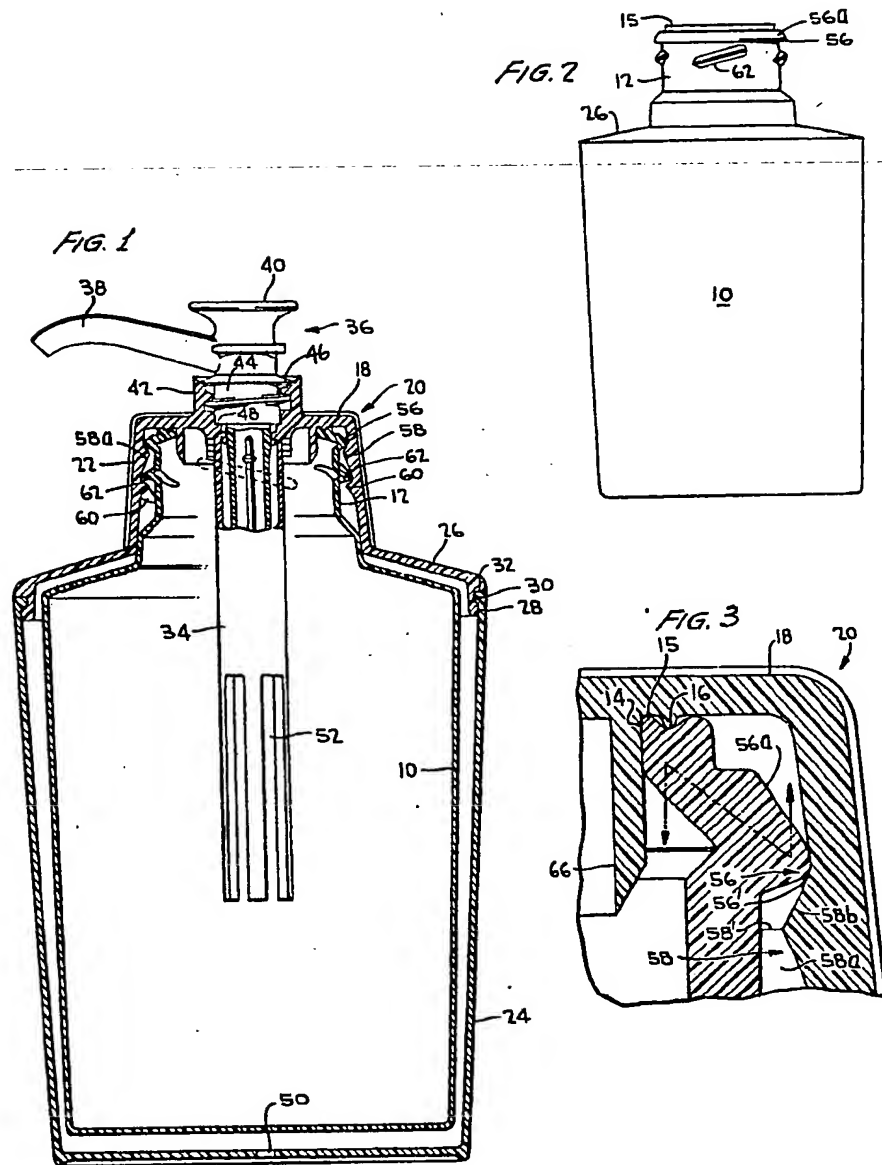
by to urge the periphery of said mouth into radial sealing engagement with said stopper.

15. In combination a container and a closure substantially as hereinbefore described with reference to and as illustrated  
5 in the accompanying drawings.

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